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ABSTRACT

In recent years colleges and universities have undertaken programs designed to interpret themselves to the larger community on an unprecedented scale. It is clear that the University of Tennessee is an important economic force on the local economy, accounting for some $123,787,021 in direct and $42,235,596 in indirect income created for a total local impact of $166,222,617. This represents over 15 percent of total local income. On the supply side, the human capital generated by the university was assigned a net present value of $687,896,769. Based on the direct spending ($134,463,536) by the university and its students, the ratio of the current value of university output measures in human capital terms to the cost of inputs is some 5.11 to 1. In an era when many public investment projects are justified by a benefit/cost ratio of just slightly more than 1 to 1, the benefit/cost ratios given for educational investments at the University of Tennessee, Knoxville, represent remarkable returns to society for its investment in education at the University of Tennessee. Statistical data accompanies the text. (Author/PG)

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THE DIRECT AND INDIRECT ECONOMIC IMPACTS OF UTK ON THE KNOXVILLE AREA, 1971-1972

by

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INTRODUCTION

In recent years colleges and universities have undertaken programs designed to interpret themselves to the larger community on an unprecedented scale. Alumni magazines have been redesigned to place emphasis on the substantive elements of campus educational activities rather than on "class notes" and sports scores; memberships on governing boards have been broadened as a way of opening two-way communications with segments of society not previously represented; alumni "colleges" have been held to acquaint former students with some of the "ways" and "whys" of change at the alma mater; and college administrators seize opportunities to speak to the Rotary Club, the Kiwanis, and other groups willing to hear them out on the perils and problems of higher education today.

While perhaps not as important as some other[illegible]s a means of illustrating what the university means to the community, a form of communication which has become popular is the "economic impact" statement which attempts to interpret to the local community some of the dimensions of the institution's financial and other economic contributions. Such reports are now routinely prepared for a variety of institutions in all parts of the country and this report fits such a mold.

A wag once suggested that it would be easy to teach a parrot economics: all that would be necessary is to train him to say "supply and demand; supply and demand!" In a more serious vein, the renowned neo-classical economist Alfred Marshall likened supply and demand to the blades of a scissors in that both the blades do the cutting together. One blade alone is notoriously ineffective. Universities, similarly,

are like the blades of the scissors: they are both demanders and suppliers in an economic sense. To put it another way, most of us as individuals play two roles in the economic system: at one moment we are providers of inputs (our labor services, the use of our savings, etc.) and at another moment we are consumers of outputs (goods and services). So it is when we look at the importance of a university to the economy of a community. The university must be understood to play a role in two ways: as a supplier of resources to business, government, non-profit organizations, and other educational institutions (primarily human capital resources) and as a demander and user of resources (labor provided by individuals, services provided by governments, and goods and services provided by business and industry). To look at only the demand or supply side of the picture is like expecting only one blade of the scissors to perform the task of cutting.

In addition to examining both sides of the economic impact coin, a complete study of this topic requires the identification of both primary and secondary impacts. Just as the stone dropped into the pond creates ripples which carry to the farthest point on the shore, so the dollar spent by the university employee is passed from hand-to-hand inside and outside of the community, creating more income and employment opportunities as it is spent and re-spent. While it is difficult to quantify with any degree of precision these "ripple" effects, we will attempt to estimate them in this study.

THE UNIVERSITY AS A CONSUMER

It is clear that the University of Tennessee is an important

economic force in the local economy. Its multi-million dollar payroll provides employment for many thousands. Its student body, in excess of 20,000, brings money into the community which is paid out to local businessmen for rent, food, clothing, and other items. Undergirding the educational enterprise are the support operations which purchase coal, telephone services, food, office equipment, automobiles, and many thousands of other products which must be available if the institution is to function. In a less direct but no less important way, many University activities and functions such as conferences, institutes, and sports events bring into the community outsiders who spend money in the local area which would otherwise be utilized elsewhere.

If we seek to measure the impact of the University on the local economy we must first measure the spending which occurs locally. It is not enough simply to take the total University budget as such a measure, for it is clear that the purchase of, for example, an automobile through a local dealer for $3,000 does not mean a $3,000 local impact since perhaps 90 percent of that sum will be forwarded out of the region to the automobile manufacturer. Thus, in a case such as this, only the $300 which remains in the area should be counted. In this study we have attempted for the major items of expenditure by the University and associated elements (students and visitors) to determine the total expenditure and the portion spent locally which could reasonably be expected to remain in the local area. In defining the "local area" we have taken it to mean East Tennessee, although it should be clear that the largest portion of any such local area impact will be concentrated

in the Knox county area and in the two adjacent counties (Anderson and Blount) comprising the Knoxville Standard Metropolitan Statistical Area (SMSA). A summary of total expenditures in various categories is found in Table 1. Here we show the total expenditures (column 1), the estimated expenditures assigned to East Tennessee (column 2), and the portion allocated outside East Tennessee (column 3). The total figures in each category and the geographical allocations were secured from those administrators directly involved with the activity. Virtually all of the salary payments listed are, it is estimated, received by residents of East Tennessee ($52,089,720 out of a total figure of $52,925,400). Of the total non-salary expenditures listed at $21,805,988, a total of $9,789,153 is estimated to have been spent in East Tennessee during fiscal 1971-1972.

As mentioned above, the direct expenditures are only part of the story of local impact. As income is passed from the hands of the original recipients to others it generates "ripple" or "multiplier" effects. The size of these effects depends on the geographical area under consideration and upon the economic structure within that area. In considering these multiplier effects we will consider the impacts of spending on the East Tennessee economy. Impacts in such a region may differ from those in other areas of the country depending upon the types of industry in the region and the degree of interrelation among such industries. In an area with little industrial or agricultural development most of each dollar spent tends to "leak out" to surrounding areas where the goods and services desired are, in fact, produced. In more highly developed areas, on the other hand, the products desired locally may

Table 1

The Estimated Direct and Indirect Impact of
University of Tennessee Expenditures
on the Knoxville Area

Activity	(1) Total Spending	(2) East Tenn. Spending	(3) Other Spending	(4) Average Multiplier	(5) Total Local Impact
Payroll:					
Systems	$ 3,530,200	$ 3,177,180	$353,020	1.35	$ 4,289,193
UTK	36,806,600	36,806,600	000,000	1.35	49,688,910
Experiment Station	4,826,600	4,343,940	482,660	1.35	5,864,319
Hospital	7,762,000	7,762,000	000,000	1.35	10,478,700
Sub Total	$52,925,400	$52,089,720	$835,680	1.35	$70,321,122
Miscellaneous Activities:					
Food Services	$ 3,959,660	$ 575,972	$ 3,383,688	2.30	$ 1,325,861
Utilities	2,958,545	2,325,789	632,756	1.30	3,021,935
Transportation Services	455,957	80,304	375,653	1.72	137,906
Construction	4,485,292	3,328,086	1,157,206	1.35	4,489,119
Farm Operation	394,686	116,432	278,254	1.35	156,601
Miscellaneous*	9,551,848	3,354,570	6,197,278	1.45	4,858,923
Sub Total	$21,805,988	$ 9,781,153	$12,024,835	1.43	$13,990,345
Total	$74,731,388	$61,870,873	$12,860,515	1.36	$84,311,467

*Includes purchases through Purchasing Department and Physical Plant.

Source: Dr. John R. Moore, Professor.

July 6, 1973

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be available from local suppliers who, in turn, have secured the constituent parts locally. In the case of the Tennessee economy, we have available a study (hereafter referred to as the "TISG study") made several years ago indicating the sizes of the multiplier effects by industry and type of expenditure not only for the state, but also for each sub-region--East, Middle, and West.* Applying these multipliers to the data reported in Table 1 gives the results shown in the right-hand column of that table. Column 4 shows the average multiplier associated with each activity sector and Column 5 shows the total local impact for each category of expenditure.** When the indirect effects of University spending are considered along with the direct effects, the total East Tennessee impact increases (for the items shown in Table 1) from $61,870,873 to $84,311,467.

Another aspect of local impact which needs consideration is student expenditures. For analytical purposes we have broken these expenditure items into two categories: rental and non-rental expenditures. In each of these categories we are interested in measuring only off-campus spending since such items as dormitory and cafeteria expenditures are reflected in the figures on University activity captured in Table 1.

Based on estimates of the number of students living in rental

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*See Tong Hun Lee, John R. Moore, and David P. Lewis, Regional and Interregional Intersectoral Flow Analysis. Knoxville: University of Tennessee Press, 1973.

**Note: In practice the expenditures were sub-divided into more detailed categories. When possible these categories were matched to corresponding sectors in the TISG study and the appropriate multipliers were applied to each. Where no such correspondence was apparent, the median multiplier value was used.

housing off campus and estimates of the average costs of such rentals, we have projected total off-campus expenditures to be $10,914,000. When multiplier effects are considered, the total impact of the rental expenditures, after all the economic repercussions are allowed for, is $14,264,550.

Purchases by UTK students in the area were projected in the following fashion. First we estimated a "year-round equivalent enrollment" based on the variations in enrollment on a quarter-by-quarter basis. This number was then multiplied by an estimated annual expenditure sum which was derived from published sources.* From this total we deducted estimated student expenditures in UTK food service facilities to get a total off-campus expenditure total of $48,818,148 which became $64,862,000 when multiplier effects were considered. Data for these two impact categories are presented in Table 2.

Table 2 also lists estimates of the spending and local impact of spending by visitors to the UTK campus. We have broken these estimates into three categories: visitors to football contests, to scheduled conferences, and to miscellaneous events. We have estimated expenditures by these groups to be $2,184,000 and the total impact to be some $2,784,600 when the indirect rounds of induced spending are included. These figures are likely to be conservative since they do not, for example, reflect spending by those attending other sporting events such as basketball games and track meets.

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*See John Caffrey and Herbert H. Isaacs, Estimating the Impact of a College or University on the Local Economy. Washington: American Council on Education, 1971. The figures in this publication are for 1967. They were adjusted upward to reflect actual changes in the consumer price index between 1967 and December 1971.

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Table 2

Estimated Direct and Indirect Impact of
University of Tennessee, Knoxville, Student and Visitor Expenditures
in the Knoxville Area

(1) Activity	(2) Total Spending	(3) East Tennessee Spending	(4) Average Multiplier	(5) Total Local Impact
Student Expenditures:				
Rental	$10,914,000	$10,914,000	1.307	$14,264,550
Non-rental	48,818,148	48,818,148	1.329	64,862,000
Sub Total	$59,732,148	$59,732,148	1.324	$79,126,550
Other Expenditures:				
Football Games	$ 1,674,000	$ 1,674,000	1.275	$ 2,134,350
Scheduled Conferences	230,000	230,000	1.275	293,250
Misc. Meetings	280,000	280,000	1.275	357,000
Sub Total	$ 2,184,000	$ 2,184,000	1.275	$ 2,734,600
TOTAL	$61,916,148	$61,916,148	1.323	$81,911,150

Source: Dr. John R. Moore, Professor.

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In Table 3 the data from Tables 1 and 2 are summarized. Here it can be seen that the total of spending in the area by the University, student body, and participants or spectators at University-sponsored events is estimated to be $123,787,021. When the indirect or multiplier effects are considered the total monetary impact on the local area is estimated to be $166,222,617.

A few final comments with regard to the spending impact may be in order. First, how much confidence can be placed on these estimates? It is difficult to answer such a question with certitude. While we have every reason to believe that the underlying estimates dividing expenditures between "local" and "non-local" were based on informed thinking, there is of course some lack of precision here. Also, while we have confidence in the soundness of the TISG methodology which is the basis for our multiplier estimates, it should be understood that these multipliers were computed from data compiled for 1964. While the usual assumption of interindustry analysis is that the underlying structural coefficients remain stable over a considerable period of time, any change in these coefficients could make these estimates inaccurate. It is likely, however, that with time the multipliers would become larger rather than smaller. Thus, if there is any error in our estimates on this account, our figures would tend to be conservative. A check of the reasonableness of the multiplier estimates is to compare our multiplier values with other similar multipliers. As pointed out above, the size of the multiplier varies with each individual situation, but it is reassuring if multiplier values independently derived are of the same order of magnitude. One multiplier derived in essentially the

Table 3

Summary of Direct and Indirect Impacts of University, Student, and Visitor Expenditures on the Knoxville Area

(1) Activity	(2) East Tennessee Spending	(3) Average Multiplier	(4) Total Local Impact
Payroll	$52,089,720	1.350	$70,321,122
Misc. Activities	9,781,153	1.430	13,990,345
Student Expenditures	59,732,148	1.315	79,126,550
Other Expenditures	2,184,000	1.275	2,784,600
Total	$123,787,021	1.343	$166,222,617

Source: Tables 1 and 2, Dr. John R. Moore, Professor.

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same manner as the TISG multiplier was developed for the University of Colorado. This multiplier, at a value of 1.36, is very close to the average multiplier value of 1.343 used in this study--thus giving us some confidence in the accuracy of our overall figures.*

A second comment concerns the comprehensiveness of the figures in this report. Any reader with knowledge of the University of Tennessee and its operations can probably spot areas and operations which are not included. The authors are aware of some of the omissions and can justify them only by saying that time and personnel constraints lead to omission of certain items whose total impact would be minimal or where estimation problems seemed insurmountable. We would, however, be most happy to receive suggestions from interested readers leading to the identification of data gaps and/or improvements in estimation procedures. To the extent that there are omissions, the reported figures are, of course, understated.

A third comment relates to this question: in a relative sense, what is the impact of University of Tennessee related outlays on the community? The answer depends on the area considered. It would appear, however, that perhaps between 15 and 18 percent of the personal income of Knox county is directly or indirectly generated by the Knoxville and vicinity activities of the University of Tennessee. If we expand the income base to include Anderson and Blount counties (the Knoxville SMSA), then the impact is reduced to perhaps 10 to 13 percent. For East Tennessee as a whole, the impact of the University probably amounts to

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*See William H. Miernyk, Impact of the Space Program on a Local Economy. Morgantown: West Virginia University Press, 1967.

somewhere between 3 and 4 percent of total income generated.*

Finally, while the impact of UTK spending is concentrated in East Tennessee, there is also an impact in other sections of the state. To illustrate the relative magnitudes of these effects, consider an expansion at UTK which would add 1,000 positions to the payroll. When all of the ripple effects had finally worked themselves out, an additional 345 workers would be needed in East Tennessee, 16 would be added to payrolls in Middle Tennessee, and 12 additional workers would be employed in West Tennessee. In other words, of a total of some 373 additional jobs indirectly created in Tennessee, 93 percent would be created in East Tennessee, 4 percent would be created in Middle Tennessee, and 3 percent in West Tennessee.**

THE UNIVERSITY AS A SUPPLIER

As we have suggested above there is a sense in which the university can be likened to any business. Just as General Motors buys labor time and materials and produces a number of models of automobiles, so the university buys faculty and staff time, utilities, classroom space, and produces liberally educated adults often trained in specialized areas such as kindergarten teaching, accounting, law, sales, city planning, mechanical engineering, farming, and so forth. Each of these individuals

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*For personal income by areas, see George Kronback, Personal Income Estimates: Tennessee, the Southeast, and the Nation, 1929 to 1970. Knoxville: The University of Tennessee, Center for Business and Economic Research, February 1972.

**Based on median "model B" multipliers from Tong Hun Lee et al., op. cit., Table 9, p. 72.

posseses skills and abilities which over the years can be used to create goods and services in the same way a machine which stamps out auto bodies for G.M. is used again and again in the production process. In fact, it has become fashionable to refer to the individual and his talents as "human capital" and to place an economic value on this "capital" in the same way the machines owned by G.M. might be valued.

There are a number of ways to place a "value" on a piece of machinery. One common method which has importance for the discussion of human capital is the "discounted stream of earnings approach." Suppose that we are dealing with a piece of equipment which will yield $100 per year in income. The equipment will last an estimated ten years. We can ask ourselves how much money we need to have now if the interest rate is 5 percent (for example) to provide the same stream of income the machine will provide. The answer to that question provides an answer to the question of the value of the machine. This is illustrated in Table 4. Such equipment has a value today of $814.

As we have noted, a similar approach can be taken to human capital. The individual will receive a given income for each year from the completion of schooling to the end of "work life" expectancy. If for the college graduate at age 22 the remaining work-life expectancy is 40 years and if the earnings level is expected to be a flat $10,000 per year, then expected lifetime earnings are $400,000 which have a "present value" of approximately $172,000. Thus if we take a human capital approach, we can say that the value today of what this human being will produce over his lifetime is about $172,000. Such an approach to measuring the economic value of human capital is now widely used in

Table 4

An Example of the Discounted Stream of Earnings Approach to the Valuation of Capital

	Year										
	1	2	3	4	5	6	7	8	9	10	Total
Current Income	$100	100	100	100	100	100	100	100	100	100	$1,000
Amount Required Today to Produce $100 Each Year (assuming a 5% discount rate)	$100	95	91	86	82	78	75	71	68	64	$ 816

Source: Dr. John R. Moore, Professor.

July 6, 1973

insurance work, in the law, and in a variety of other applications. It can also be used as one way of looking at the value of the output of a college or university.

Applying the "discounted stream of earnings" approach to the students completing work at the University of Tennessee during the period from July 1, 1971 to June 30, 1972 requires that we make a number of assumptions. Because these assumptions may not be in precise accord with the underlying facts, it must be understood that the final estimates are only to be considered rough approximations. In making these earning capacity estimates we have looked at four categories of students: male graduates, male non-graduates, female graduates, and female non-graduates. In each case we have also estimated the gross value of the human capital added for the year, allowing for discounting and productivity changes and for the net human capital value--that is, the value added by the college education alone. We have also broken the net value figure down into two geographical components: net human capital value exported and net human capital value remaining in the East Tennessee area.

In our calculations, we have assumed that the output of the University can be measured by the number of students completing their education (via graduation or other form of termination) during the year. Table 5 summarizes the human capital calculations and shows that the gross value of the human capital output of UTK in 1971-1972 is estimated to be $2,722,418,805. This figure represents the total lifetime earning capacity of all those completing attendance at the University

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Table 5

Gross and Net Human Capital Values Associated With
University of Tennessee, Knoxville Education
1971-1972

Student Category	(1) Gross Human Capital Value	(2) Net Human Capital Value	(3) Net Human Capital Value Exported from East Tennessee	(4) Net Human Capital Value Remaining in East Tennessee
Male Graduates	$1,783,850,880	$557,453,400	$273,152,166	$284,301,234
Male Non-Graduates	722,243,354	76,331,892	37,402,627	38,929,265
Female Graduates	142,212,730	44,440,824	21,776,004	22,664,820
Female Non-Graduates	74,111,841	9,670,653	4,738,620	4,932,033
Total	$2,722,418,805	$687,896,769	$337,069,417	$350,827,352

Note: Gross Human Capital Value is the total expected lifetime earnings adjusted to discount the total by a 5 percent discount rate and to allow for a 4 percent annual growth in productivity.

Net Human Capital Value is the estimated additional lifetime earning capacity due to the additional education provided by the University of Tennessee. Thus, for example, the figure for male graduates is the gross figure for college graduates less a comparable gross figure for the same number of males who complete high school only.

The estimate of the export of human capital versus residual human capital values is based simply on the estimated ratio of the number of graduates leaving the region to the total number of graduates (=49 percent).

Source: Dr. John R. Moore, Professor.

July 6, 1973

that year (with allowance for discounting to present value and allowance for productivity trends). Clearly, however, the University cannot take credit for the entire earning capacity of the individual, but only that portion of earning capacity added by University attendance. This addition to earning capacity is the difference between the gross figure and what would be earned by a similar group completing only high school. The net figures shown in column 2 reflect this additional earning capacity and the figure is seen to be $687,896,769. We have further broken down this net figure into the human capital exported from East Tennessee ($337,069,417) and the human capital remaining in East Tennessee ($350,827,352).

SUMMARY

Looking at the data on the University and related activities as a demand element in the local economy, it is apparent that the University is a major force, accounting for some $123,787,021 in direct and $42,435,596 in indirect income creation for a total local impact of $166,222,617. This was seen to represent something over 15 percent of total local income.

On the supply side, the human capital generated by the University was assigned a net present value of $687,896,769. Based on the direct spending ($134,463,536) by the University and its students, the ratio of the current value of University output measured in human capital terms to the cost of inputs is some 5.11 to 1. In an era when many public investment projects are justified by a benefit/cost ratio of just slightly more than 1 to 1, the benefit/cost ratios given above for educational investments at UTK represent remarkable returns to society for its investment in education at the University of Tennessee.